

TEST TECHNOLOGY DEVELOPMENT & DEMONSTRATION PROGRAM

CANDIDATE NOMINATION PROPOSAL

FOR

NEXT GENERATION INSTRUMENTATION BUS STANDARD

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Code 5.4

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**TTD&D PROPOSAL
for the
NEXT GENERATION INSTRUMENTATION BUS STANDARD**

Category of Project:

Range Instrumentation and Test

Description:

The Common Airborne Instrumentation System (CAIS) has demonstrated the viability and utility of a standard instrumentation bus. As a result of this success and the ever increasing data requirements, there is a clear need to begin work on the next generation instrumentation bus. In recognition of this need, the Telemetry Group of the Range Commander's Council (RCC) has established a task to survey the available commercial and military busses. The ultimate goal of this task is the adoption of an established high speed bus as an IRIG standard for future instrumentation systems. To date, IEEE Std 1394-1995 (Firewire) is the leading candidate for this standard.

Firewire is a newly developed commercial communications bus. The commercial electronics industry is broadly and rapidly adopting Firewire as their standard. By 1998, personal computers, printers, audio and video equipment all will have Firewire interfaces. Firewire is versatile (handling multiple data types), fast (up to 400 Mbits/sec now with plans for 1.2 Gigabits/sec), inexpensive (normal copper wire), and robust. Firewire shows great promise as the backbone of the next generation test article data acquisition network.

The Airborne Instrumentation Reliance Panel (now a subgroup) has endorsed the need for a next generation instrumentation system, named the Joint Data and Communication System (JDACS). The implementation of the JDACS solution utilizing a fast, robust IRIG standard, such as Firewire, is critical. The goal of this TTD&D is to do the engineering analysis and research that will lead to an existing bus standard, such as Firewire, becoming an IRIG standard. This research and analysis will significantly reduce the risk, cost, and schedule associated with executing future CTEIP instrumentation programs, including the JDACS Solution.

This TTD&D will be supported by RCC members from all three services. The Army point of contact is Mr. Ray Faulstich of the Yuma Proving Ground, the Air Force point of contact is Mr. Ken Temple of the Air Force Flight Test Center, the Navy point of contact is Mr. Dan Skelley of the Naval Air Warfare Center Aircraft Division.

Requirement:

Current programs such as F/A-18 E/F, F-22, and JSF all have composite data rate requirements that exceed the capacity of any single instrumentation system bus. These programs have accommodated their data requirements with a clumsy arrangement of multiplexers. The increased fusion of data from numerous sources (i.e. analog measurements, digital buses, digital radar data, and digitized video) will simply overwhelm this approach. The instrumentation community needs a single standard instrumentation bus with data rates 10 to 40 times that of current systems (with future growth capability to 100 times). To comply with Acquisition Reform and the emphasis on COTS hardware, the instrumentation community needs to adopt a high speed bus as a standard. This would provide the instrumentation vendors a clear commercial interface standard that can be used to modify/develop COTS hardware. This is a tri-service need, recognized by the RCC, and all three services are participating in this task.

Project Goals:

This goal of this TTD&D is to determine whether an existing bus standard, such as Firewire, is suitable as a standard for the next generation instrumentation bus. This will involve engineering analysis, research, and support culminating in a technology demonstration.

Other Information:

Army Point of Contact:

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Air Force Point of Contact:

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Development & Demonstration Strategy:

Phase one of this TTD&D will be the detailed definition of the requirements for the next generation instrumentation bus. This will begin with a comprehensive analysis of the overall data acquisition network requirements. Once the overall data acquisition network requirements are defined, the required capabilities of the instrumentation bus can be developed.

Phase two will be a technical review of the existing bus standards, such as Firewire, to determine if any meet the bus requirements developed in phase one. This analysis shall include:

- 1) Compatibility of data protocols with the requirements.
- 2) Compatibility of the physical layer with the environment (EMI, vibration, temperature, etc.)
- 3) Verification that the standard has sufficient detail to guarantee compatibility

Phase three will be a technology demonstration to verify that the bus or busses selected in phase 2 can perform in the required environment. This technology demonstration will consist of laboratory tests in simulated aircraft environments.

Phase four will provide the RCC engineering support to write the IRIG Standard for the next generation instrumentation bus based on the selected bus

If the outcome of phase two or three reveals that no existing standard will meet the requirements, this TTD&D project will be terminated.

a. Estimate of Quantity of Systems to be Fielded:

The IRIG Standard bus will be utilized as the instrumentation bus standard by the entire instrumentation community both air and ground. Over the course of the standard's useful life (projected to be about 15 years), it is estimated that in excess of one thousand test articles will utilize this standard.

b. Program Elements Supplementing TTD&D Funding:

None

c. Program Elements Funding Program:

The development of hardware that utilizes this standard bus will be funded by industry, major airframe Engineering Model Development (EMD) Programs, and the JDACS solution.

d. Other Technology/Ongoing R&D Programs:

The current CAIS development, which is nearing completion, developed a set of core hardware, ground support software, and a bus standard. The core hardware has been successfully fielded on both the F/A-18 E/F and F-22

programs. The CAIS bus is being embraced by the tri-services as a standard instrumentation bus. Due to the limited data rates (around 10 Mbits/sec), this bus will have a 5 to 7 year life cycle. This TTD&D, and the RCC task, will look beyond this to the next generation. The goal is to replace the CAIS bus standard with an existing standard that will operate 10 to 40 times faster with expansion capability to run as much as 100 times faster than the CAIS Bus. This should give the instrumentation community enough “room to grow” so that this standard will remain effective for approximately 15 years.

The CTEIP funded Advanced Range Telemetry (ARTM) project being managed out of the Air Force Flight Test Center is focused on improving the efficiency of the telemetry link. During the execution of this TTD&D there will be a close and continuous communication with the ARTM project. ARTM requirements on the instrumentation system will be factored into the phase one requirements definition. If the ARTM project utilizes a bus standard for communication between it’s various components (ground or air), that bus will be carefully evaluated in phase two and three to see if it meets the requirements for the instrumentation bus. This will assure that the bus chosen is compatible with the ARTM requirements.

7. Schedule:

	Year 1	Year 2	Year 3
Develop Requirements	X-----X		
Study Bus Standards	X-----	-----X	
Laboratory Demonstration Tests		X-----	-X
Prepare TTD&D Project Report and Support Generation of IRIG Standard			X-----X

8. Budgetary Information (\$1,000's):

	Year 1	Year 2	Year 3
Develop Requirements	\$125		
Study Bus Standards	\$150	\$150	
Laboratory Demonstration Tests		\$175	\$50
Prepare TTD&D Project Report and Support Generation of IRIG Standard		\$25	\$75
Total	\$275	\$350	\$125

9. Project Point of Contact Information:

a. DoD Component or POC:

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b. TTD&D Project manager:

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c. Responsible Local Accounting and Finance

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